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DEHYDRATING FREESTONE PEACHES

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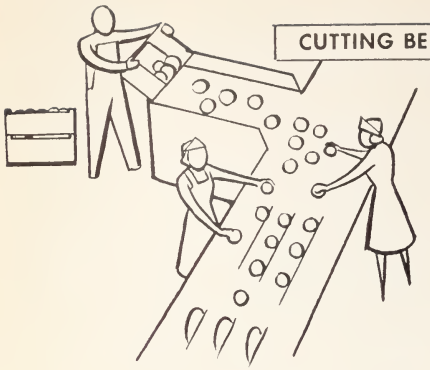
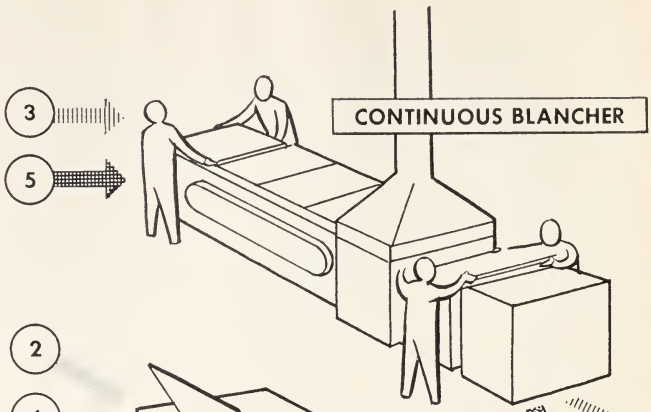
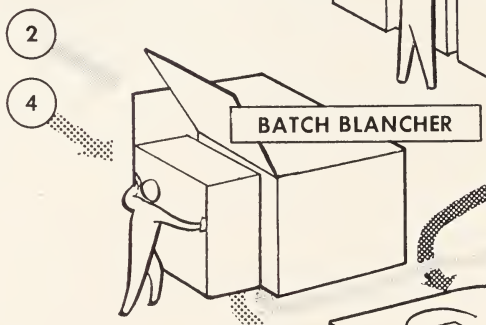
THE COLLEGE OF AGRICULTURE
UNIVERSITY OF CALIFORNIA • BERKELEY

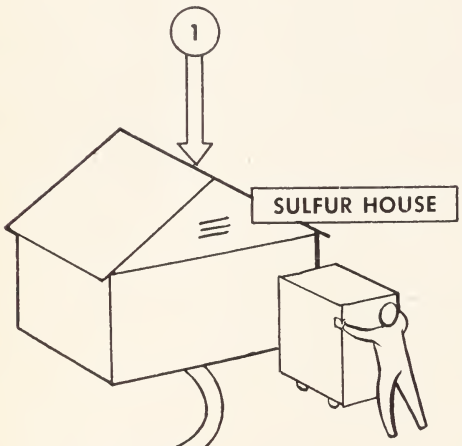
FREESTONE PEACH

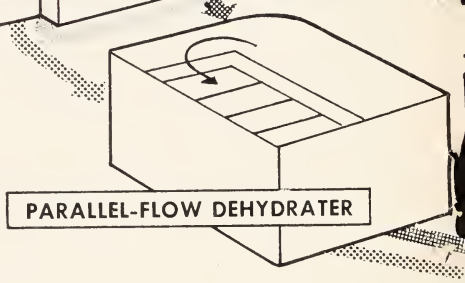


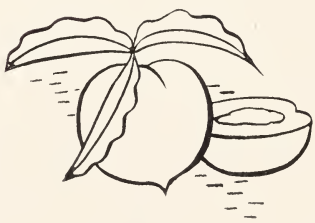


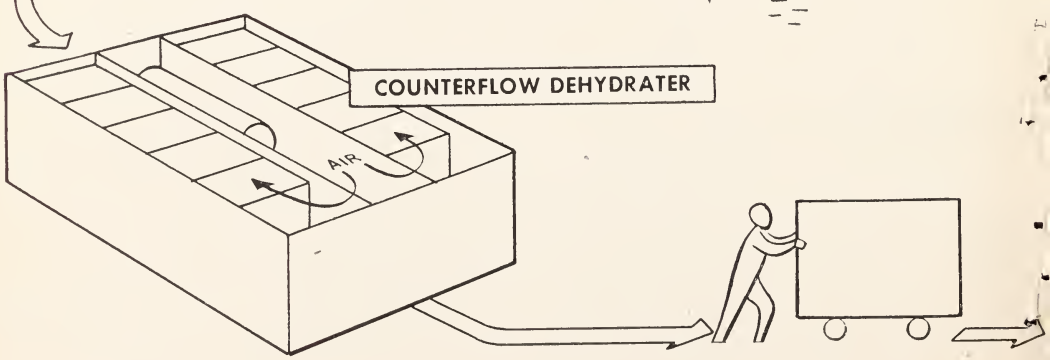
To dehydrate peaches successfully by any method: select clean, firm, ripe peaches; handle with care to prevent bruising; size-grade and then dry by size for more even drying; tray fruit with cut side up to save juice.











DEHYDRATION FLOW CHART

The chart shows five different assembly line arrangements for the dehydration process. The least expensive equipment is required for number 1. For each arrangement from 1 to 5, more expensive equipment is needed.

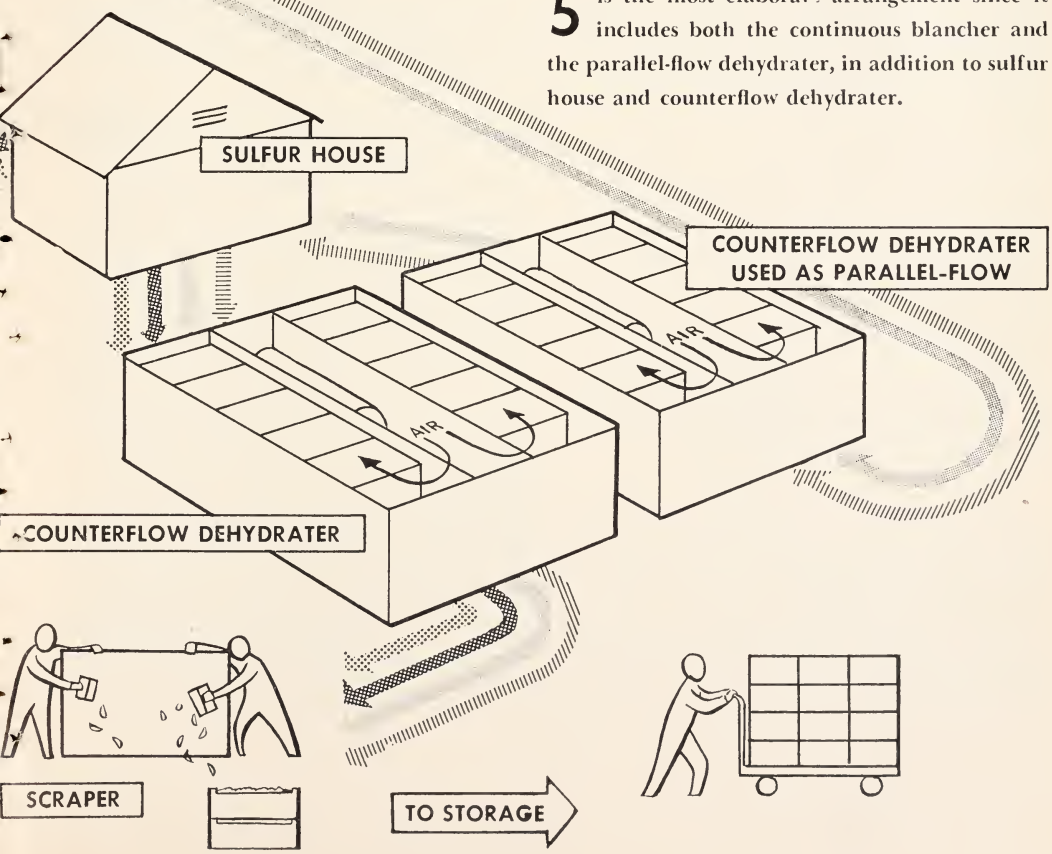
1 omits the blanching process entirely. After being cut, fruit is sulfured, goes through the counterflow dehydrater, and is ready for scraping.

2 uses the batch blancher, requiring prior stacking of trays to completely fill blancher. Double use is made of the counterflow dehydrater by introducing the wet, sticky blanched fruit at the hot end of one tunnel for removal of excess moisture before sulfuring, thus using it as a parallel-flow tunnel. This step is advisable in order to eliminate bleeding. Then after sulfuring, fruit enters the cold end of the second tunnel, which is used as a counterflow dehydrater, to complete drying. Fruit then emerges for scraping.

3 introduces the continuous blancher, into which fruit may be placed either one or two trays at a time as it comes from the cutting line. Stacking of trays follows blanching in this case. Again fruit is introduced at the hot end of one tunnel for a preliminary drying, as in method 2, followed by sulfuring and final counter-current dehydrating.

4 makes use of the batch blancher. The fruit then goes for a short time through a parallel-flow dehydrater—an added piece of equipment in this line. It then proceeds on a straight line through sulfur house and counterflow dehydrater.

5 is the most elaborate arrangement since it includes both the continuous blancher and the parallel-flow dehydrater, in addition to sulfur house and counterflow dehydrater.



DEHYDRATING FREESTONE PEACHES

E. M. MRAK AND R. L. PERRY

What Advantages Does Dehydration Offer?

MODERN DEHYDRATION methods can produce dried freestone peaches of good color, texture, and vitamin content, in considerably less time than sun-drying and without contamination from dry-yard dust, dirt, or insect infestations.

Besides cutting down losses due to unfavorable weather conditions, in the long run dehydration is a cheaper method than sun-drying.

It is good business practice, in the fruit industry as in all food enterprises, to keep products clean throughout every stage of processing, and dehydration offers the more sanitary method.

Dehydration, on the other hand, calls for more costly equipment than sun drying, since a dehydrater must be provided, in addition to the ordinary cutting, traying, and sulfuring facilities. If the peaches are blanched, a blancher and a boiler are also necessary.

Freestone peaches can be dehydrated without being blanched, but blanching results in a substantial reduction in the time required for sulfuring and drying (16 to 18 hours as compared with 24 to 30), and yields a better and more translucent dried fruit. In determining your own procedure, you must weigh these advantages against the added cost of blanching equipment and its operation.

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Good-quality dehydrated freestone peaches have a trade acceptance which is as high as *clean*, good-quality sun-dried freestones. Although standards have not yet been established, best quality of peaches is generally considered to be those which are translucent. Dehydrated fruit which has first been blanched will generally retain translucency; unblanched peaches generally do not have it. *In no case will sun-drying or dehydration improve an inferior fruit; immature peaches will retain their green color with either form of processing, but the color is more apparent in dehydrated fruit than in that dried in the sun.*

The over-all drying ratio of freestones ranges from 4 to 8. Yields per acre in dried tons are: low, 1 ton; medium, 2 tons; high, 4.5 tons.

Dehydration methods for blanched and for unblanched peaches will be discussed separately in this circular.

Machinery Reduces Labor Costs, Increases Profits

Mechanization must be the trend in fruit processing, as it is in most industries, in order to cut down excessive labor costs. Machines which cut and pit fruit are now being manufactured; mechanical stackers to handle loaded fruit trays in the drying plant are obtainable, as well as mechanical tray scrapers for the dried product.

It will pay the operator to lay out the plant so that the various steps in dehydrating can be followed in sequence, without loss of man-hours by unnecessary handling of the fruit. Elimination of extra handling will reduce labor, and this will be reflected in smaller costs per pound of processing the fruit.

Inside the cover of this circular is sketched a suggested arrangement of equipment. Size of the plant, amount and capacity of equipment will depend on the tonnage of the fruit to be handled. (See table at end of circular.)

Less Equipment Needed for Unblanched Fruit

For freestone peaches to be dehydrated without blanching, the steps are as follows:

1. Pick the fruit carefully to prevent bruising.
2. Grade for sizes.
3. Cut and pit (by hand or by machinery); tray the fruit.
4. Sulfur peaches 4 to 5 hours.
5. Dehydrate 24 to 30 hours at 150° to 155° F.
6. Determine moisture content and store.

Picking the Peaches

Pick freestone peaches when they are eating ripe, handling carefully to prevent bruised, discolored fruit. Damaged fruit results in a discolored product. Do not pick peaches off the ground, because the fruit will certainly be damaged by bruising, imbedded dirt, insect infestation, or flesh deterioration due to standing in the sun. Peaches thus harvested produce a poor dried product; in fact, there is always a possibility that the price of such fruit, when dried, will not cover the cost of processing.

Grading for Sizes

To avoid uneven drying grade the fruit into sizes, especially if orchard-run peaches are being handled. Smaller pieces will be overdried while the larger halves are still too moist, if various sizes are dehydrated at the same time. At least two sizes should be maintained in the grading. This will allow each size to be dehydrated separately and uniformly.

Cutting, Pitting, Traying

Cut the fruit, either by hand in the usual manner, or by use of pitting machine. Tray the halves with the peaches close together, cup side up to prevent spilling of juice. The ordinary 3×6-foot wooden tray will hold an average of about 50 pounds of cut peaches.

There is little, if any, present commercial value to peach pits. If they are to be used as fuel, they should be spread out to dry as quickly as possible. If not, they should be hauled away from the plant and covered with chlorinated lime to prevent insects from breeding in them.

Sulfuring the Peaches

Sulfuring unblanched freestone peaches for dehydration will take at least 4 hours in a tightly constructed, air-vented sulfur house, burning about 5½ pounds of clean sulfur per single car of 25 trays of fruit. There should be enough sulfur to burn for 3½ hours. Lovells may require a heavier sulfuring than other varieties (5 hours unless bleeding becomes excessive). It is important that the sulfur used be entirely free from oil or other foreign substances, and that it burn completely without residue (slag), in order to get the needed amount of the sulfur dioxide (SO_2) into the fruit, and to prevent waste of material.

If the sulfur house holds more than one double car or two single cars of fruit, it is better to burn sulfur at both ends of the house to obtain a more even distribution of the sulfur dioxide.

For details on the sulfuring process, see Circular 382, "Sulfur-House Operation."

Dehydrating the Peaches

Place the cars of sulfured peaches in the dehydrater at the cool end of the dehydrater. It should take from 24 to 30 hours to dry unblanched freestone peaches. They should be held in the dehydrater until the moisture content is reduced to 25

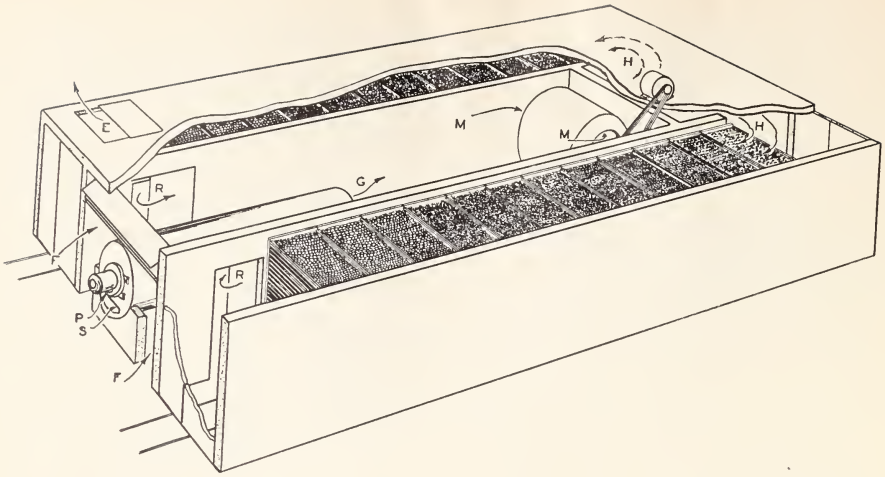


Fig. 2.—Double-tunnel, counterflow, direct oil-fired dehydrater with centrifugal fan: *E*, exhaust air; *F*, fresh air; *G*, gases heated in furnace; *H*, hot air delivered by fan to tunnels; *M*, mixture of fresh air, gases heated in furnace, and recirculated air entering the fan; *P*, primary fresh air for initiating combustion in the furnace; *R*, recirculated air; *S*, secondary fresh air for completing combustion in the furnace.

to 28 per cent unless the weather is cool or humid. Under ordinary weather conditions, in the central valleys of California, peaches will continue to lose moisture after they are removed from the tunnel until they reach a final moisture content of about 20 per cent. This will require holding the stacks for about 24 hours after removal from the tunnel and before scraping.

Types of Dehydraters. The countercurrent dehydrater (fig. 2) is the type most widely used for fruits. Cross-flow dehydraters (fig. 3) are also used, and a modified type of cross-flow equipment, planned so that units may be built in various sizes, may be constructed from plans available at the University of California.

Any type of fruit dehydrater can be used sucessfully, *providing the humidity does not reach a point where sulfur is lost.*

A good approximate rule is this: after a fresh car of fruit has been introduced to a dehydrater (whatever type) the dry-bulb thermometer reading at the cool end should be 15 degrees higher than the wet-bulb. If this minimum difference does not exist at all times, there is a good possibility that sulfur will be lost.

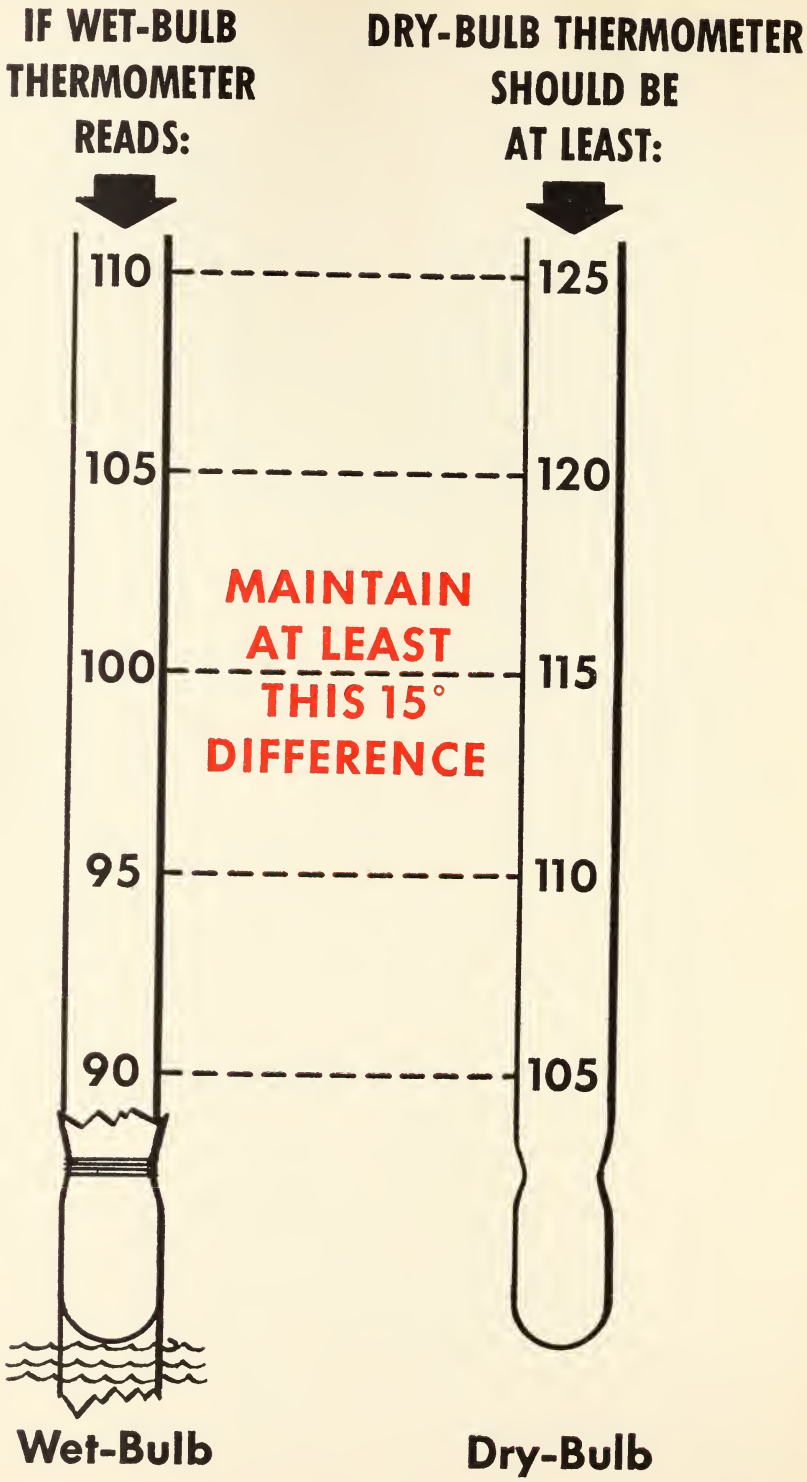
The use of the dry- and wet-bulb thermometers will be discussed under "Temperature and Humidity." It should be stressed, however, that ***both*** of these instruments are highly important to successful dehydrater operation, and you should familiarize yourself with their use.

Heating the Air. Air for the dehydrater is heated in several ways, including: (1) direct heat, which can be used only with a fuel and burner which do not produce smoke, soot or undesirable fumes, such as natural gas; (2) direct radiation, by which the heat from burning fuel is carried through the furnace walls, flues, or radiators; and (3) indirect radiation by means of steam or hot-water radiators (a method not often used in California). The last two methods allow use of low-grade fuel because smoke or soot do not come into contact with fruit. Whatever heating method is used, equipment must eliminate soot and smoke.

Guide Charts for Dehydrating Peaches

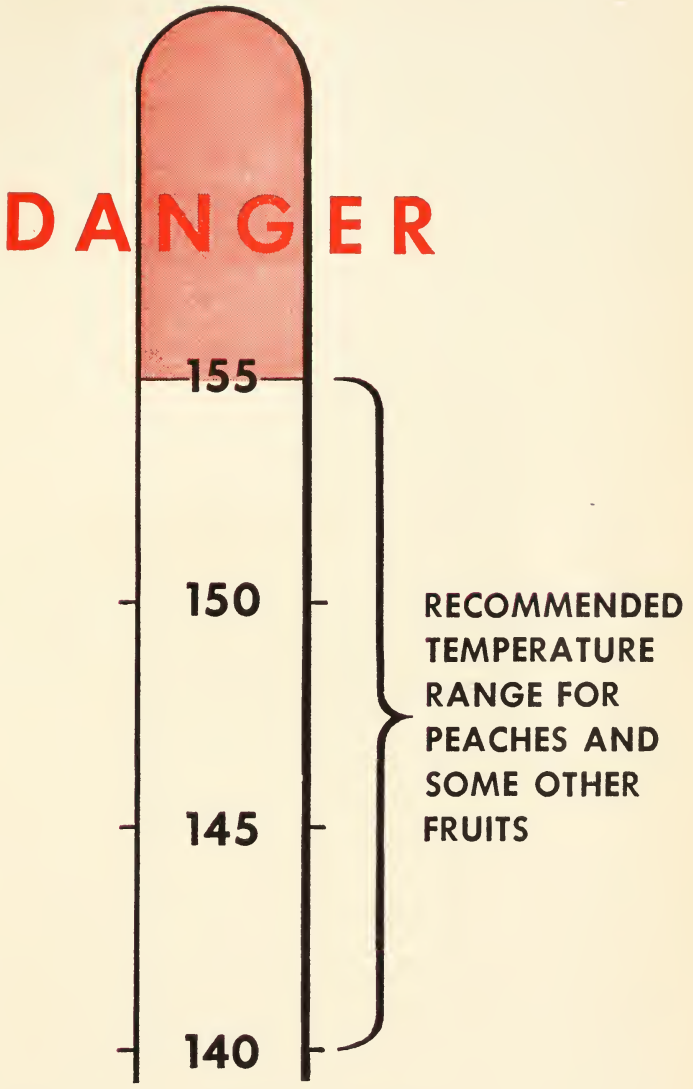
May be used for freestones and clingstones; also for apricots, pears, nectarines, and golden bleached raisins

AT COOL (wet) END



TEAR OUT AND HANG AT COOL END OF YOUR DEHYDRATER

AT HOT (dry) END



DRY-BULB THERMOMETER

TEMPERATURE (DRY BULB) SHOULD NOT EXCEED 155°

TEAR OUT AND HANG AT HOT END OF YOUR DEHYDRATER

Temperature and Humidity. Each dehydrater should have one wet-bulb and two dry-bulb thermometers to measure temperature and humidity.

Put the dry-bulb thermometers at opposite ends of the air current, one at the hot (dry), finishing end, the other at the cool (wet), entering end. Place the wet-bulb thermometer wherever convenient ***so long as it is in the direct air flow.*** The location is otherwise unimportant. Many operators put the wet bulb next to the dry bulb at the cool end for ease in comparing the two readings.

The dry-bulb at the hot end of the dehydrater will give you the finishing temperature; when it rises too high, there is danger of scorching or otherwise damaging the fruit, so that its storage life will be shortened. If the fruit is to be dried to a final moisture content not lower than 25 per cent, the finishing temperature may be no higher than 155° F. It is best, however, to remove the fruit when the moisture content is from 25 to 30 per cent. Left in the dehydrater longer, the fruit will tend to darken more rapidly when stored.

If the peaches are taken from the dehydrater with as much as 25 to 30 per cent moisture content, they must remain on the trays for about 24 hours to permit drying to approximately 20 per cent, or to the moisture content required by the packing house before delivery. In foggy climates, this procedure will not apply, since the dehydrated fruit may actually pick up more moisture if allowed to stand on the

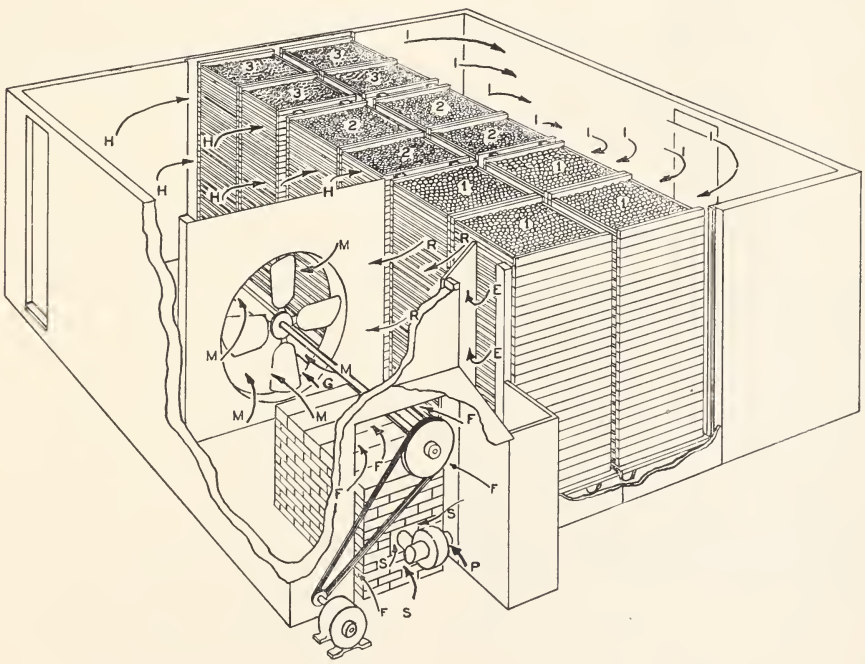


Fig. 3.—Cross-flow dehydrater, with axial-flow fan: *1*, first position of fruit, when fresh; *2*, second position of fruit, partially dried; *3*, third position of fruit, nearly dried; *E*, exhaust air, escaping out of adjustable door; *F*, fresh air, entering beside furnace; *G*, gases heated in furnace; *H*, hot air delivered by fan to fruit in second and third positions; *I*, intermediate air passing from fruit in second and third positions to that in the first position; *M*, mixture of fresh air, gases heated in the furnace, and recirculated air entering the fan; *P*, primary fresh air for initiating combustion in the furnace; *R*, recirculated air passing from the fruit in the first position to the furnace chamber; *S*, secondary fresh air for completing combustion in the furnace.

cars after removal from the dehydrater. In such cases, the hot air temperature in the dehydrater is lowered to about 140° F, and the fruit is then dried to the required low moisture content before being taken from the tunnel for storage. The temperature is lowered because the fruit is more apt to scorch when the moisture content is low.

The dry-bulb at the cool end, *used in conjunction with the wet-bulb,* gives you data to determine the humidity. It is not necessary to understand the principles involved in these thermometers to use them successfully. The card inserted in the center of this circular will give you the various minimum relations which must be maintained between the *cool-end* dry-bulb and the wet-bulb thermometer. Tack it up on your dehydrater for further reference.

As has been stated, the difference between the cool-end dry-bulb and the wet-bulb thermometer *should always be more than 15 degrees.* When it is less you are losing sulfur.

Loading the Tunnel. If the tunnel is loaded with too many cars or if they are introduced in too rapid succession during the dehydrating process, the humidity will become excessive and the drying rate will be greatly reduced. As the drying rate slows, very large losses in sulfur dioxide take place. When loading a dehydrater always maintain at least the 15° difference between the wet- and dry-bulb thermometers, as mentioned above.

Determining Moisture Content

The best way to determine moisture content is by an electric moisture tester which is recommended for any operator whose volume justifies the initial cost. Many experienced dehydrater operators, however, learn to approximate the moisture content of the fruit by its feel. The knack is difficult to describe, but it can be learned. Test several samples of your fruit by hand, then take them to a packing house for a moisture-tester run. You should soon be able to feel the differences. Remember, there is a difference between hot and cold fruit—it not only feels different, its moisture content will vary. Occasionally check the accuracy of your judgment by having other samples tested at the packing house during the season.

Storing Dried Peaches

After the fruit has reached the desired moisture content and has cooled sufficiently to make handling easy, scrape it from the trays and store it. Although bulk storage in bins is sometimes practiced, storage in clean, wooden boxes is recommended because it is much more sanitary and the fruit is less liable to damage during the storage period.

Blanched Peaches Take Less Time to Dehydrate

Both the sulfuring and the drying of blanched peaches will take considerably less time than when the fruit is handled without blanching. Sulfuring will require about one-half to one hour less, while time in the dehydrater is reduced from 24–30 hours to 16–18 hours.

That there is a substantial saving in actual processing time where peaches are blanched is shown by the comparative time schedule in table 1, which contrasts the two methods of dehydration.

When picking peaches which are to be blanched before dehydrating, take special care to prevent discoloration due to bruising, and avoid harvesting underripe fruit. Steam-blanching is likely to fix any green coloration in the fruit, so the peaches should be harvested as evenly ripe as possible in order to get the most attractive dried product.

Grading, cutting and pitting, and traying the fruit are done exactly as for fruit which is dried without blanching, but at this point in the process the difference in handling begins.

Table 1

COMPARATIVE DEHYDRATING TIME FOR BLANCHED AND UNBLANCHED PEACHES

Freestone peaches	Steam blanching	Pre-drying	Sulfuring	Dehydrating	Approximate total time
	minutes	minutes	hours	hours	hours and minutes
Unblanched	.....	.....	4	24 to 30	28 to 34
Blanched	4 to 8	40 to 60	3½	16 to 18	20:14 to 22:38

Subsequent steps will be as follows:

1. Blanch fruit 4 to 8 minutes.
2. Test blanched halves to determine degree of steaming.
3. If a dehydrater is available, predry the fruit about 40 minutes and allow to cool before sulfuring; otherwise, merely allow fruit to cool.
4. Sulfur 3 to 4 hours.
5. Dehydrate 16 to 18 hours.
6. Determine moisture content and store fruit.

Blanching the Peaches

Blanch the peaches from 4 to 8 minutes, according to the size, variety, and maturity, and the efficiency of the blanching equipment. Either a continuous or a cabinet type of blancher may be used, according to the size of the operation. For small batches of fruit, the cabinet type is preferred, while for the larger operation the continuous type is more suitable.

Whichever type is used, there must be an adequate-sized boiler to provide steam under pressure. If a reconditioned boiler is installed, it must be in condition to pass state inspection. A permit is required to operate any boiler carrying over 15 pounds per square inch pressure, with the boiler subject to inspection by the California Industrial Accident Commission. The planning and construction of a blancher is somewhat more technical than the scope of this circular. California Experiment Station Bulletin 698, available from your farm advisor, discusses blancher construction.

Steam Temperature. Steam temperature for blanching the fruit must be at least 190° F at a point one third of the continuous-blancher length from the entrance and around 212° F at a point two thirds of the way through. If the cabinet blancher is used, the steam temperature should be about 212° F.

Testing Blanched Fruit

Properly blanched, the fruit emerging from the blancher will be steamed a little more than two thirds through. Enough heat will remain in the fruit so that it will complete the cooking of each piece while the trays are stacked at the end of the blancher for cooling. The surface temperature of the fruit drops rapidly, but

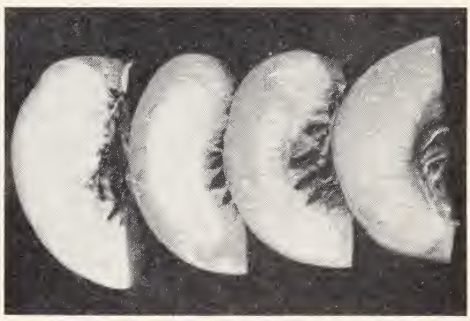


Fig. 4.—Peach segments above, from left to right, were blanched 0, 3, 6, and 9 minutes. Light colored areas indicate underblanching. Care should be exercised to avoid condition shown in third segment, where blanching is almost, but not quite, complete.

the center cools more slowly, and the blanching of the fruit is finally quite even throughout each piece.

To test for proper blanching, allow the fruit to stand in the stack on the tray for 5 to 10 minutes. Then halve several pieces, using a sharp knife. The cooked area will be translucent (see fig. 4). An opaque, uncooked area will indicate underblanching. As it dries, such fruit has a tendency to brown in the unblanched areas.

Pre-Drying the Fruit

When possible, blanched peaches should be pre-dried before they are sulfured, since the sulfuring causes additional softening of the tissues and results in bleeding and loss of juice. As soon as possible after the blanching (cooling is not in this case necessary), run the stacks of trayed fruit into a dehydrater tunnel *at the hot end*, so that they move through the tunnel in the same direction as the air current.

Temperature of the tunnel at the end where the fruit enters should be between 180° and 190° F. ***The fruit must not remain in the tunnel more than 40 to 60 minutes*** before it comes out at the cool end. New cars can be placed in the tunnel about every 10 to 15 minutes, making it possible to have four cars in the dehydrater at the same time when pre-drying. A single tunnel should, therefore, pre-dry about 3 tons of fruit per hour.

Although preferable, it is not absolutely necessary to pre-dry the fruit. When a dehydrater is not available for pre-drying, allow the fruit to cool after blanching, then sulfur.

Sulfuring the Fruit

After it is pre-dried, the fruit should be cooled 10 to 15 minutes before being sulfured, to increase sulfur dioxide absorption. It may be necessary to use a fan to cool the fruit quickly. It will take 3½ hours to sulfur blanched peaches, burning

Table 2

EQUIPMENT FOR DEHYDRATING BLANCHED, SULFURED FREESTONE PEACHES

Type and size of dehydrater	Number of cars		Number of 2-car sulfur houses	Number of 1-car blanchers	Over-all length of continuous blancher, 6 feet wide	Capacity in tons of peaches	
	In dehydrater	Loaded with trays				Fresh	Dried
University type:							
1 unit:							
6 cars	6	12	2	1	..	5	0.8
9 cars	6	12	2	1	..	5	0.8
2 units:							
12 cars	12	24	4	1	18	10	1.7
18 cars	12	24	4	1	18	10	1.7
Tunnel (counterflow) type:							
1 unit, 12 cars	10	20	4	1	18	10	1.7
2 units, 24 cars	20	40	5	1	18D*	20	3.4
3 units, 36 cars	30	60	8	1	27D*	30	5.1
4 units, 48 cars	40	80	10	2	36D*	40	7.0
5 units, 60 cars	50	100	13	2	45D*	50	8.5
6 units, 72 cars	60	120	15	2	54D*	60	10.0

* D refers to double-decked trays in blancher.

5½ pounds of sulfur per single car of fruit containing about 25 trays.

As previously stated, the sulfur house should be tightly constructed but air-vented to insure complete burning, and good, clean sulfur should be used to insure economical and effective sulfur absorption.

Completing the Process

After the fruit is sulfured, it is dehydrated according to the method already detailed, except that blanched peaches require but 16 to 18 hours to dry to the moisture content of 25 to 30 per cent. After being dried, the fruit is stored as already discussed.

Equipment List Given for New Installations

This circular is especially designed for growers and small-scale processors who already have equipment. But for those who are planning to install equipment, table 2 is included, to help them plan the size of plant needed for their tonnage. The information is given both for the University dehydrater (a cross-flow type) and for a tunnel, or counterflow dehydrater.

Either single-car or continuous blanchers may be used for most of the dehydrater sizes listed in the table. But the continuous blancher is not recommended for freestone peaches with dehydraters of capacity of nine cars or less, because the rate of handling does not justify the attendant labor which would sometimes be idle.

The number of sulfur houses is based on the assumption that the sulfur house will be loaded three times a day and that the drying time is 16 hours.

For both types of blanchers, the figures given are based on 8 hours cutting time per day. With two or more units of the tunnel dehydrater, the length given for a continuous blancher is with double-decked trays (indicated by *D* in the table) in the blancher.

You may note that the number of cars the table suggests putting into the dehydraters is less than the rated capacity, except with the University-type 6-car and 12-car dehydraters. The rated capacity applies to prunes. Peaches have a much faster drying rate, and to get good results with them, the number of cars loaded into the dehydrater at one time must be reduced. Even with the University-type 6-car and 12-car dehydraters, results may not be entirely satisfactory when they are filled to capacity with peaches. But these are two-row dehydraters, and the only simple way to reduce the number of cars would be to put in a single row (3 or 6 cars). This would cut the capacity in half—more of a reduction than is necessary or usually practical.

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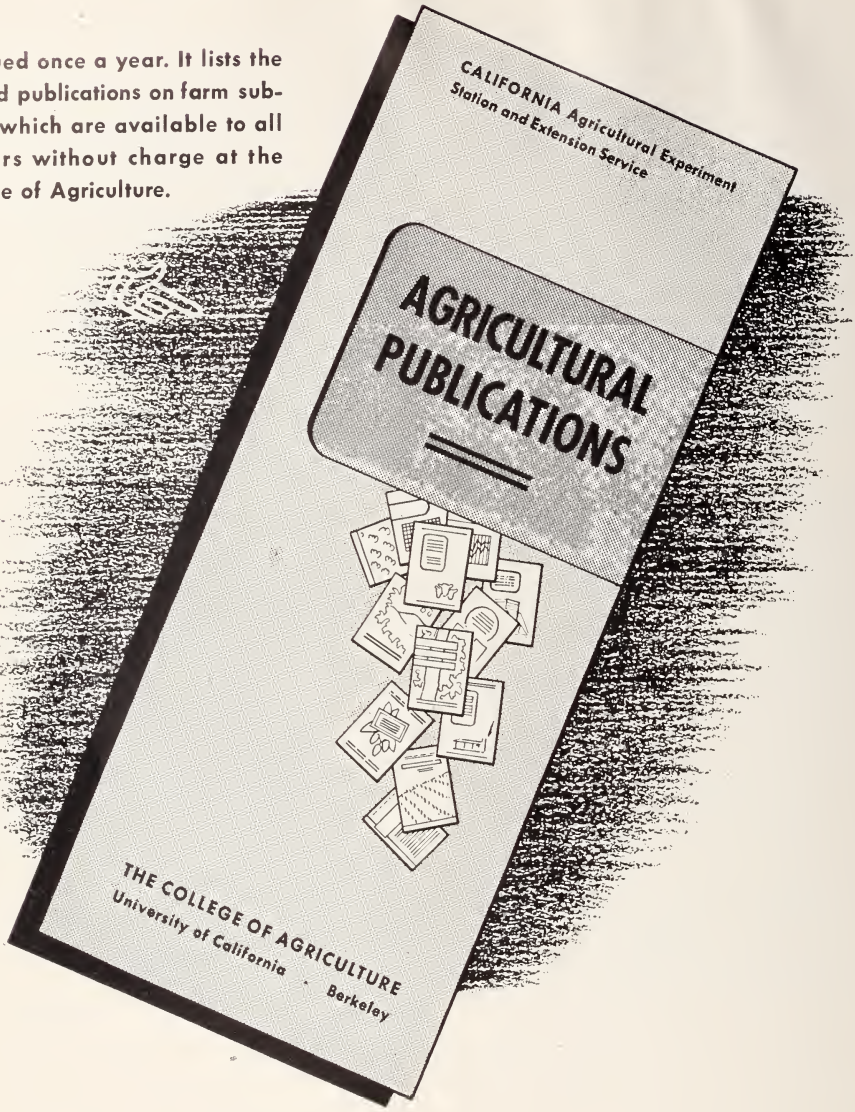

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